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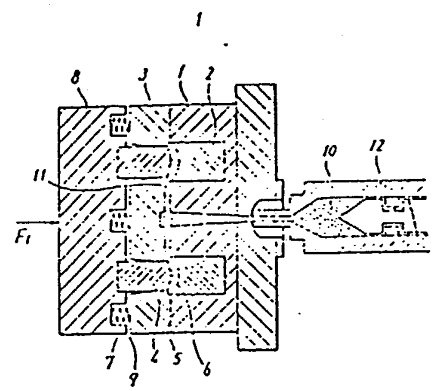
00804C/01 A32 (A89) DAIL 13.05.78 DAICEL KK *J5 4148-055 13.05.78-JA-056804 (19.11.79) B29d-11 B29f-01 Injection moulding shrink-free thick plastic lenses - by injecting molten resin into the cavity, and advancing the platen to create a higher pressure to compensate or absorb resin shrinkage	A(11-B12A, 12-L2A). 323
The method comprises prepg. a moving platen supporting a movable mould part and having core moulds passing through the mould part; closing the mould part while leaving a clearance between the movable platen and the mould part; injecting molten resin into the cavities between the core moulds and a fixed mould part under relatively lower pressure; and advancing the platen against the mould part so that a higher pressure is applied onto the resin. A shrink-free plastic lens is moulded in a simple two-stage compression mechanism. (3pp46)	 J54148055

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⑤度付レンズの成形方法

㉑特　　願　昭53—56804
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明　　細　　書

1. 発明の名称　度付レンズの成形方法

2. 特許請求の範囲

同一分離線上にゲートとキャビティとを有するレンズ成形用金型において、移動コアを摺動貫通自在に収納する移動コア板の一面を、弾性体を介して作動板により支持し、反対面を固定コアを収納する固定コア板により当接支持し、射出成形機の油圧を利用して得られる低型締圧と上記弾性体の反発力とを移動コアの縮代を残すようにバランスさせて型締し、次にキャビティ内に溶融樹脂を上記低型締圧以下の射出圧で充填し、然るのち射出成形機の油圧を利用して得られる最高型締圧で上記作動板を押圧して上記移動コア縮代だけ移動コアを押し込むと同時に、射出圧を上記最高型締圧によるゲートからの溶融樹脂のバックフローを防止するに充分な保圧にすることを特徴とする度付レンズの成形方法。

3. 発明の詳細な説明

本発明は度付レンズの成形方法に関する。

従来から光学レンズにはほとんどガラスが使用されてきたが、最近プラスチックスの表面をガラス並の硬度にする表面硬化技術が開発され、光学レンズにもプラスチックスレンズが使用される様になって来た。

しかし、プラスチックスレンズの多くは射出成形によって作られるため、成形歪を皆無にすることは難しく、又、度付レンズになるとレンズ中央部の肉厚が厚くなるため、金型内に充填された溶融樹脂が冷却時に体積収縮を起し厚肉部に「ヒケ」を生じる。

この「ヒケ」を防止する最も効果的な方法として金型内での溶融樹脂の体積収縮分を圧縮によりカバーする射出圧縮成形方法が周知である。そして、従来の射出圧縮成形法では合せ金型を使用して、キャビティとゲートとをパーティング面(金型の分離面)に沿設し、溶融樹脂の圧縮にはコアを作動させる方式が一般的に使われているのも周知である。この場合、射出成形機とは独立した油

圧装置をセットして、この油圧でコアを作動させる。

しかし多数個取りの金型になると溶融樹脂を圧縮するのに大きな油圧を必要とし油圧装置が大型化して、金型に取付けることが実質的に困難になるという欠点があった。

本発明者等は射出成型機の型締力を利用することで上記欠点を排除し、極めて簡単に「ヒケ」と「歪」のない度付レンズの成形方法を発明した。

即ち、同一分離線上にゲートとキャビティとを有するレンズ成形用金型において、移動コアを摺動貫通自在に収納する移動コア板の一面を、弾性体を介して作動板により支持し、反対面を固定コアを収納する固定コア板により当接支持し、射出成形機の油圧を利用して得られる低型締圧と上記弾性体の反発力とを移動コアの締代を残すようにバランスさせて型締し、次にキャビティ内に溶融樹脂を上記低型締圧以下の射出圧で充填し、然るのち射出成形機の油圧を利用して得られる最高型締圧で上記作動板を押圧して上記移動コア締代だ

け移動コアを押し込むと同時に、射出圧を上記最高型締圧によるゲートからの溶融樹脂のバックフローを防止するに充分な保圧にすることを特徴とする度付レンズの成形方法である。

本発明は非常に簡単な金型構造でしかも普通の射出成形機をほとんどそのまゝ使用出来る点に特徴の一つがある。

以下に本発明を図示の実施例に基づいて説明する。

第１図は本発明の方法に使用する金型の概略を示す断面図であり、第２図は圧縮工程の状態を示す断面図である。

作動板(8)にセットされた移動コア(4)を摺動貫通自在に収納した移動コア板(3)は、固定コア板(1)によりパーティング面(5)で当接支持され、該移動コア板(3)の固定コア板(1)と反対側の面は弾性体(7)を介して作動板(8)により支持されている。

更に固定コア板(1)には移動コア(4)と相対する位置に固定コア(2)がセットされ、この固定コ

ア(2)と移動コア(4)とでキャビティ(6)が形成されている。先づ、射出成形機(12)の油圧を利用して得られる低型締圧(F_1)で作動板(8)を押して移動コア板(3)を固定コア板(1)に押圧し、この低型締圧(F_1)と弾性体(7)の反発力とがバランスする位置に移動コア(4)を保持させる。

このとき移動コア板(3)と作動板(8)との間に作動代(9)即ち移動コア締代が残されることで溶融樹脂の体積収縮分を含んだキャビティ(6)が形成される。次に射出成形機(12)で溶融された樹脂(10)をゲート(11)からキャビティ(6)内に、上記低型締圧以下の圧力で射出充填させた後、型締圧を上記射出成形機(12)の最高型締圧(F_2)に上圧し移動コア(4)を押し込み前進させることでキャビティ(6)内の溶融樹脂(10)を圧縮すると同時に射出圧を上記最高型締圧(F_2)により溶融樹脂(10)がゲート(11)からバックフローするのを防止するに充分な保圧に切替えることにより圧縮成形する。

本発明に於ける低型締圧・最高型締圧・射出充填圧・保圧等は成形する樹脂の性質・射出成形機の

諸元により最適値を決定し得るが、射出充填圧は３００〜５００kg/cm²，保圧は６００〜１０００kg/cm²を適当とする。又、弾性体は材質の面からと使い易さからスプリングを最適とするが、別に限定はされない。

以下に比較例と実施例を示す。

（比較例）

アクリル樹脂を射出成形機で溶融し、金型温度80℃，射出圧９００kg/cm²，型締力１４０^{Ton}の条件で射出成形した。

得られたレンズには同心円上の「ヒケ」がはっきりと観察された。

（実施例）

上記アクリル樹脂を上記射出成形機で溶融し、金型温度８０℃，低型締力４０^{Ton}，充填射出圧４００kg/cm²の条件で金型内に溶融樹脂を充填した後、型締圧を１４０^{Ton}に上げると同時に、射出圧を１０００kg/cm²の保圧に切替えて成形した。

得られたレンズには「ヒケ」は全く観察されなかっ

た。

以上の如く本発明は普通の射出成形機の型締力を充分に利用し、簡単な構造の金型・成形条件・平衡等を考慮することにより「ヒケ」や「歪」のない度付レンズを成形することが出来る極めて有益な発明である。

4. 図面の簡単な説明

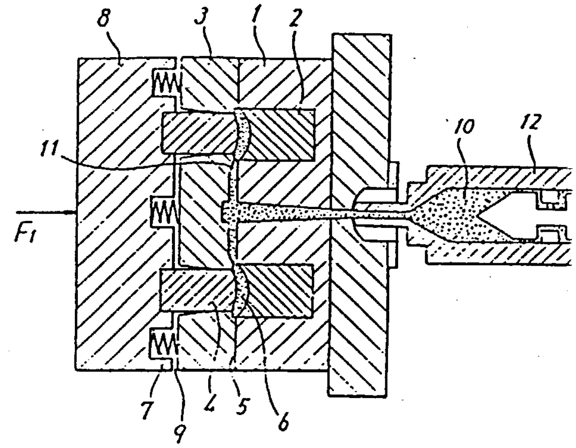
第1図は本発明の方法に使用する金型の構造を示す断面図であり、低型締圧と弾性体の反発力とがバランスした状態を示し、

第2図はキャビティに充填された溶融樹脂を最高型締圧で圧縮している状態を示す断面図である。

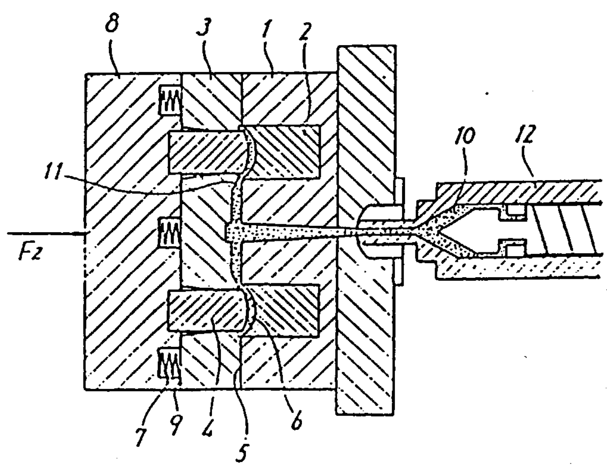
図中、1は固定コア板，2は固定コア，3は移動コア板，4は移動コア，6はキャビティ，7は弾性体，8は作動板である。

特許出願人　ダイセル株式会社

第1図



第2図



Japan Patent Office

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Magnifying Lens Forming Method

Patent Application: Sho53-56804 May 13, 1978

Inventors:

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SPECIFICATION

1. Title of Invention:

Magnifying Lens Forming Method

2. Scope of Patent Claim:

A magnifying lens forming method which involves establishing gates and cavities along the same separation lines in lens forming metal molds, and characterized by a moving core being free to pass through a compression hole, where one surface of a movable core core plate is supported via an elastic means by an operating plate, while on the opposite surface, there is a fixed core plate which holds a fixed core the two are in contact, so that by utilizing the hydraulic pressure of the injection molding machine, a low mold binding pressure is balanced with the above described rebound force from the elastic member to leave some

binding force on the movable core to bind the mold together; next, the molten resin is injected into the cavity under a pressure which is lower than the above mentioned low binding pressure of the mold and then the hydraulic pressure of the injection molding machine is utilized at the maximum binding pressure of the mold in order to exert pressure against the above described operating plate so that the above described movable core binding is moved, pressing the moving core in, while at the same time, the injection pressure prevents back flow of the resin from the gate due to the above described maximum mold binding pressure.

3. A Detailed Description of the Invention:

This invention concerns a method of forming lenses. In the past, optical lenses have almost always been made of glass, but more recently, plastic surfaces having a hardness close to that of glass have been developed using surface hardening technology. Thus, plastic lenses have come into use as optical lenses.

However, since most plastic lenses are formed using injection molding, it is difficult to ignore the warp which results from forming. With magnifying lenses, the center area of the lens is thicker, so that when the molten resin used to fill the mold cools, shrinking causes "whiskers" to appear in the thick part of the lens.

The most effective method is a universally known injection compression forming technique which involves compressing the volume of the molten resin within the mold in order to prevent the formation of these "whiskers." With the injection

compression forming method of the prior art, a split mold is used a cavity and gate are established along the parting surface (the separation surface for the mold) and then in order to apply the compression to the molten resin, a core is activated in normal methods of implementation. In this case, a hydraulic cylinder is set to operate the core using hydraulic pressure.

However, when using a multi-cavity mold, a very high hydraulic pressure is required to compress the molten resin. This would mean that a very massive hydraulic device would have to be installed for the mold, which is difficult to do practically.

We inventors, however, have developed a method to use the mold binding force of an injection molding machine to eliminate the above described defects and provide a very simple method for avoiding the above described "whiskers" and "warp" in a magnifying lens forming method.

To wit, this invention's magnifying lens forming method involves establishing gates and cavities along the same separation lines in lens forming metal molds, and characterized by a moving core being free to pass through a compression hole, where one surface of a movable core core plate is supported via an elastic means by an operating plate, while on the opposite surface, there is a fixed core plate which holds a fixed core the two are in contact, so that by utilizing the hydraulic pressure of the injection molding machine, a low mold binding pressure is balanced with the above described rebound force from the elastic member to leave some binding force on the movable core to bind

the mold together; next, the molten resin is injected into the cavity under a pressure which is lower than the above mentioned low binding pressure of the mold and then the hydraulic pressure of the injection molding machine is utilized at the maximum binding pressure of the mold in order to exert pressure against the above described operating plate so that the above described movable core binding is moved, pressing the moving core in, while at the same time, the injection pressure prevents back flow of the resin from the gate due to the above described maximum mold binding pressure.

This invention involves a very simple mold structure, having the advantage that normal molds can be used almost as they are in this process.

Below, figures showing examples of this invention will be used to describe it further.

Figure 1 shows a simplified diagram of a metal mold used to implement the method of this invention in a cross-sectional view; Figure 2 shows a cross-sectional view of the compression process.

The operating plate (8) is set upon a movable core (4). Movable core plate (3) is housed fee to pass through the pass through hole in movable core (4), making contact at the parting surface (5) of the fixed core plate (1). The fixed core plate (1) and the opposite surface of said movable core plate (3) are supported by the operating plate (8) via the elastic member (7).

Further, on the fixed core plate (1) a fixed core (2) is established in a position opposite the movable core (4). This fixed core (2) and the movable core (4) form cavity (6). First,

the hydraulic pressure from injection molding machine (12) is used to create a low mold binding force (F1) which presses against operating plate (8), pushing the moving core plate (3) against the fixed core plate (1). This low mold binding force (F1) and the rebound force from the elastic member (7) hold the movable core (4) in a state of balance.

At this time, there is an operating margin (9) between the movable core plate (3) and the operating plate (8), in other words, this operating margin is left to compensate for the volume shrinkage of the molten resin, and allows the cavity (6) to be formed with this extra volume. Next, the molten resin (10) in the injection molding machine (12) passes through gate (11) into cavity (6), being injected at a pressure which is less than the above described binding pressure so that the cavity is filled. Then, the mold binding pressure is elevated to the maximum mold binding pressure (F2) of the above mentioned injection molding machine, and the movable core (4) is pushed forward so that the molten resin (10) inside of the cavity (6) is compressed, while at the same time, the maximum mold binding pressure (F2) prevents back flow through gate (11) for the compression molding process. In this invention, the low mold binding pressure, the maximum mold binding pressure, the injection filling pressure, and the retention pressure are determined by the type of resin and the properties of the injection molding machine being used, but normally, the injection filling pressure is between 300 and 500 kg/cm², the retention pressure is between 600 and 1000 kg/cm². Also, springs are most appropriate from an ease of use standpoint

as the elastic members, but there are no particular limitations on this.

Below, examples and comparison examples will be described:

(Comparison Example)

Acrylic resin was melted in an injection molding machine, and injection molded at a metal mold temperature of 80°C, pressure of 900 kg/cm^2, and a mold binding force of 140 tons.

The resulting lens had concentric round "whiskers" clearly visible within.

(Example)

The same acrylic resin was melted in the same injection molding machine as described above, and injected at a metal mold temperature of 80°C and a low binding force of 40 tons. The injection pressure for filling was 400 kg/cm^2. Then, while increasing the mold binding pressure to 140 tons, the injection pressure was retained at 1000 kg/cm^2 in forming the lens. The resulting lens had absolutely no visible "whiskers."

As described above, this invention utilizes the binding force of the mold and provides a method which uses a simple mold structure and the conditions of the injection molding in order to prevent the formation of "whiskers" and "warp" in formed magnifying lenses.

4. A Simple Explanation of the Figures:

Figure 1 is a cross sectional view of a mold which can be used to implement the method of this invention, it shows the mold in a condition of balance between the low binding pressure and the repulsion of the elastic members.

Figure 2 shows the application of the maximum binding pressure with the cavity filled in a cross-sectional view. In the figures, 1 is a fixed core plate, 2 is a fixed core, 3 is a movable core plate, 4 is a movable core, 6 is a cavity, 7 is an elastic member, and 8 is an operating plate.

Figure 1

第1図

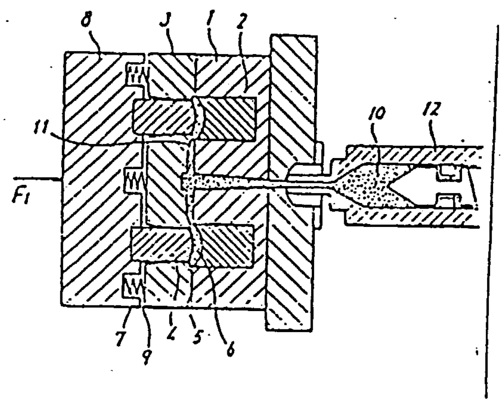

Figure 2

第2図